

Framework for Establishing Paper System Baselines:

Using SCS 002 (ANSI) Life-Cycle Impact Assessment

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Standardization of LCIA

ISO 14044 Life-Cycle Assessment

International scope and assessment framework for LCA

ASTM E06.71.10 Draft Power Declarations

LCIA impact category indicators for power systems

SCS-002 LCIA Declarations (ANSI Process)

LCIA impact category indicators for all products and services

EU LCIA Requirements

European Union is finalizing LCIA category indicators for products and services

Key Features of SCS 002

- Provides complete set of environmentally relevant LCIA impact category indicators
- Requires site-specific LCIA data to minimize assumptions and limit the uncertainty of results
- Provides protocols for establishing comparative baselines
- Provides protocols for establishing EPP status using these reference LCIA baselines

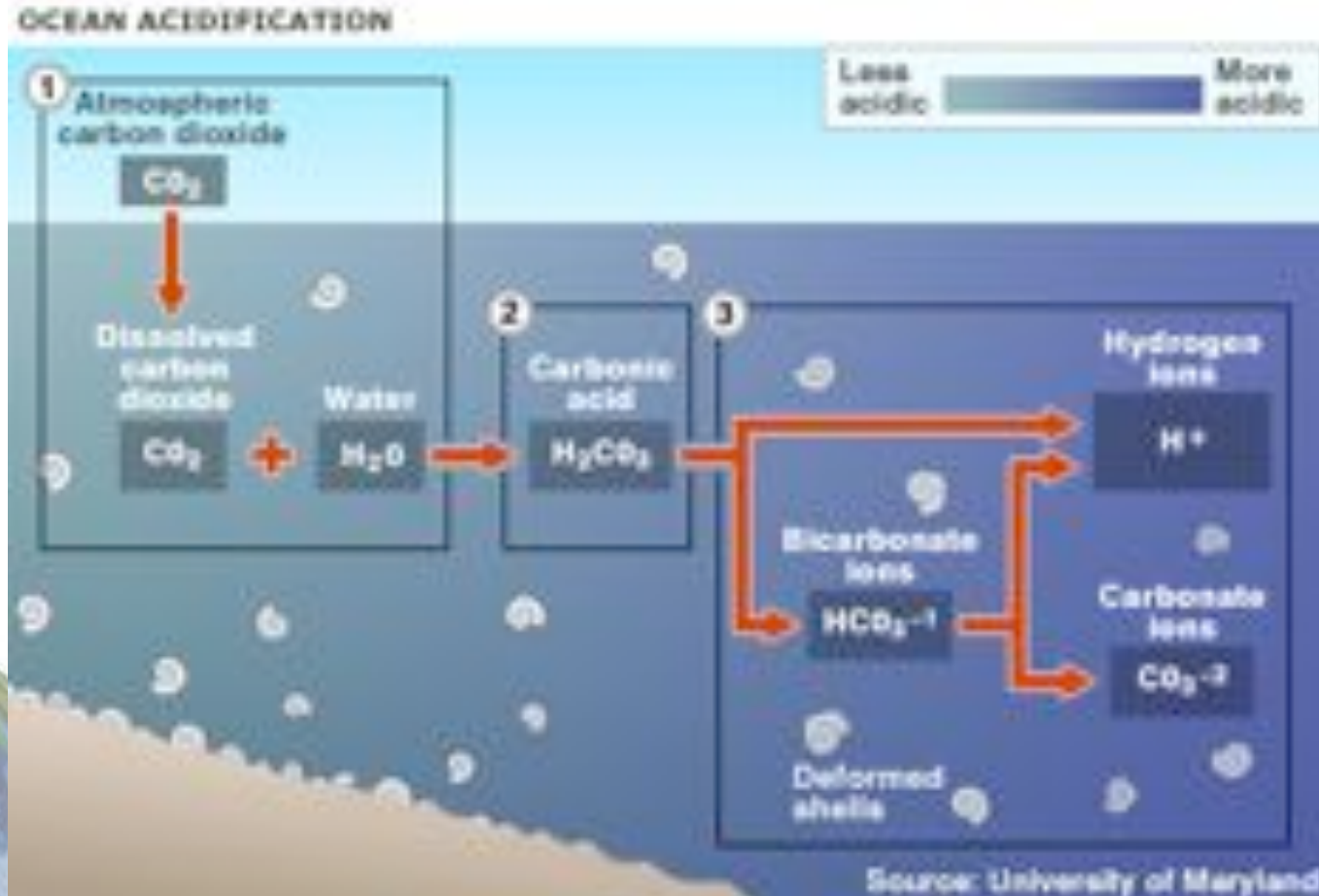


Impact Category Indicators

SCS 002

Natural Resource Depletion	
	Non-Renewable Feedstock Resources
	Bio-Based Resources
	Water Resources
	Strategic Metals Resources
Landscape Destruction	
	Terrestrial Habitats
	Aquatic (River) Habitats
	Aquatic (Lake) Habitats
	Riparian/Wetland Habitats
	Loss of Key Species
Global/Regional Chemical Emission Levels	
→	Acidification (Oceanic)
	Acidification (Regional)
	Stratospheric Ozone Depletion
	Ecotoxicity
→	Eutrophication
	Neurotoxicity
Human Health Chemical Exposure Levels	
	Ground Level Ozone
	PM 2.5
	Pulmonary Hazardous Chemicals
	Ingestion Hazardous Chemicals
	Indoor Inhalation Hazardous Chemicals
	Noise
Hazardous Wastes	
	e.g. Radioactive Wastes

Oceanic Acidification: The Other Major Impact of CO₂



Eutrophication: Kills Sea Life

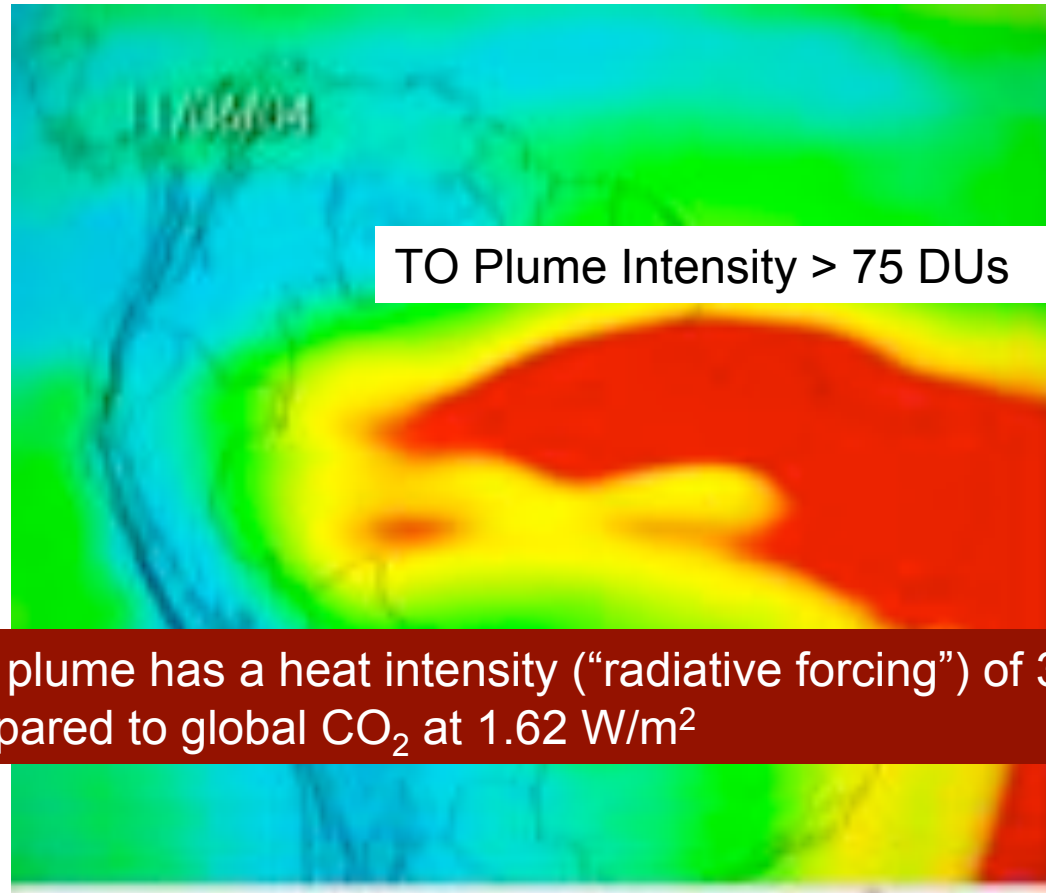


This impact category accounts for all three major types of eutrophication separately (BG algae, COD, Terrestrial)

Climate Change: LCIA Metrics Includes the Shorter Lived, Highly Potent GHG Pollutants

GHG Pollutants	Relative potency on annual basis compared to CO ₂ (“Global Warming Potential”)
Carbon Dioxide (over 100 years)	1
Methane (Up to 20 years)	105
Black Carbon (Weeks)	30,000
Tropospheric Ozone (Weeks)	19,889
Unwanted Cooling from Aerosols	4,852

Climate Change: The Brazilian Tropospheric Ozone Plume has Twice the Heat Intensity of Global CO₂



This plume has a heat intensity (“radiative forcing”) of 3.2 W/m² compared to global CO₂ at 1.62 W/m²

Source: NASA OMI O3 Satellite

Supporting EPP Procurement with LCIA



Definition of Environmentally Preferable Products

“Products that have a lesser or reduced impact on human health and the environment when compared with standard products **[or baselines]** that serve the same purpose.”

(Executive Order 13101)





LCIA Baselines for the State of California

- **Overall Procurement Baseline**

The cumulative LCIA impact levels from total state purchases for all product categories.

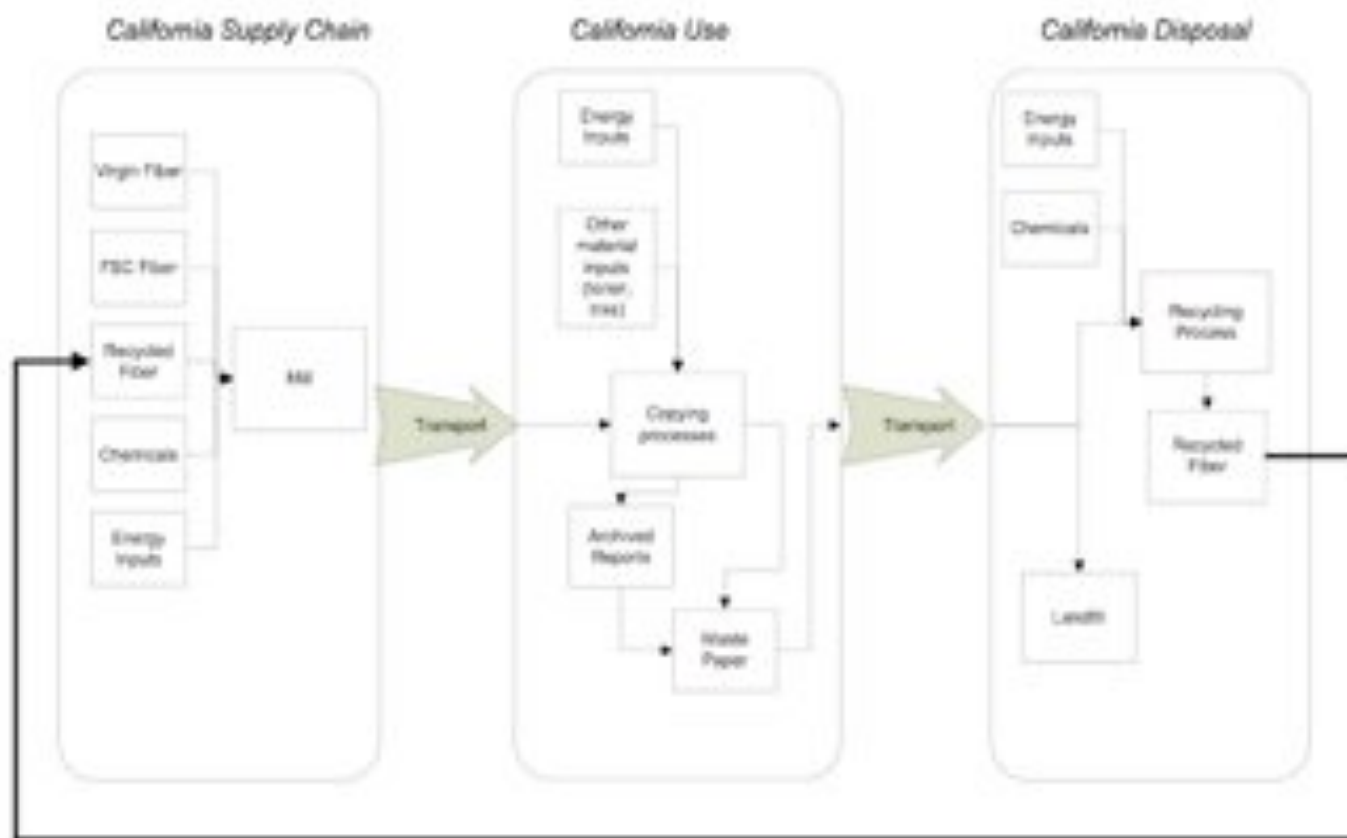
- **Paper System Baseline**

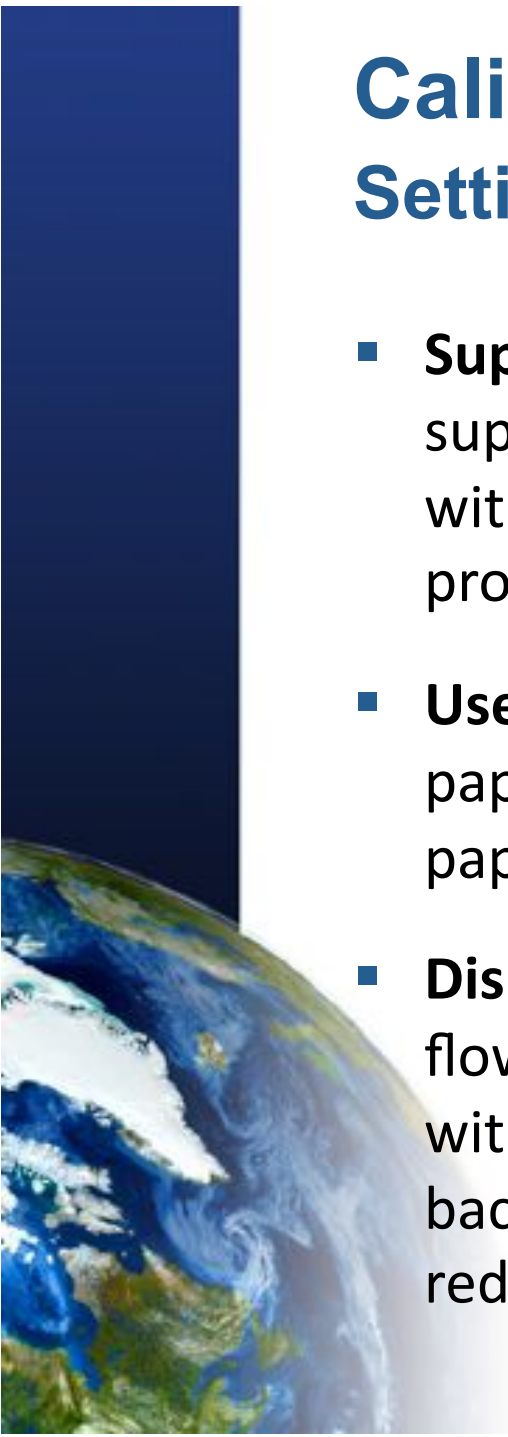
Current LCIA impact levels related to the production, use and disposal of paper of the state.

- **Paper Production Sub-System Baseline**

Averaged impacts derived from range of LCIA profiles of the paper purchased by the state.

State of California Paper System





California Paper System Baseline

Setting the Stage for Reducing Impacts

- **Suppliers: LCIA Paper Declarations** from mills supplying the State for the total amount purchased with the EPP objective of buying the lowest impact profile paper at the lowest cost.
- **Use:** Tracking % total internal waste, % storage of paper documents with the EPP objective of reduced paper use.
- **Disposal: LCIA Disposal Declarations** Follow waste flows from the State, and associated LCIA impacts with disposal and reprocessing of secondary fiber back into recycled paper with EPP objective of reducing impacts for the entire State paper system.

Life Cycle Impact Declaration

100% Recycled Office Paper

Relevant Impact Categories

Impact Levels of Product (Compared to Virgin Paper Baseline)

RESOURCE DEPLETION

Non-Renewable Energy Resources

Water

Wood Resources

LANDSCAPE DISRUPTION

Terrestrial Habitat

River Habitat

Riparian & Wetland Habitat

Key Species

IMPACTS FROM EMISSIONS

Accumulated GHG Loading

Oceanic Acidification

Regional Acidification

Eco toxic Loading

Eutrophication (Regional)

Ground Level Ozone Exposures

PM 2.5 Exposure

Systemic Toxic Chemicals (Dermal, Ingestion)

HAZARDOUS WASTES

Clay Waste



* Based on Life-Cycle Impact
Assessment (SCS-002)

◀ Lower Impact Level

Virgin Paper
Baseline

Higher Impact Level ▶





Life Cycle Impact Declaration

50% Recycled / 50% FSC Fiber, Regionally Sourced

Relevant Impact Categories

Impact Levels of Product (Compared to Virgin Paper Baseline)

RESOURCE DEPLETION

Non-Renewable Energy Resources
Water
Wood Resources

LANDSCAPE DISRUPTION

Terrestrial Habitat
River Habitat
Riparian & Wetland Habitat
Key Species

IMPACTS FROM EMISSIONS

Accumulated GHG Loading
Oceanic Acidification
Regional Acidification
Eco toxic Loading
Eutrophication (Regional)
Ground Level Ozone Exposures
PM 2.5 Exposure
Systemic Toxic Chemicals (Dermal, Ingestion)

HAZARDOUS WASTES

Clay Waste



* Based on Life-Cycle Impact
Assessment (SCS-002)

◀ Lower Impact Level

Virgin Paper
Baseline

Higher Impact Level ▶



Life Cycle Impact Declaration

50% Recycled / 50% SFI Fiber, Regionally Sourced

Relevant Impact Categories

Impact Levels of Product (Compared to Virgin Paper Baseline)

RESOURCE DEPLETION

Non-Renewable Energy Resources
Water
Wood Resources

LANDSCAPE DISRUPTION

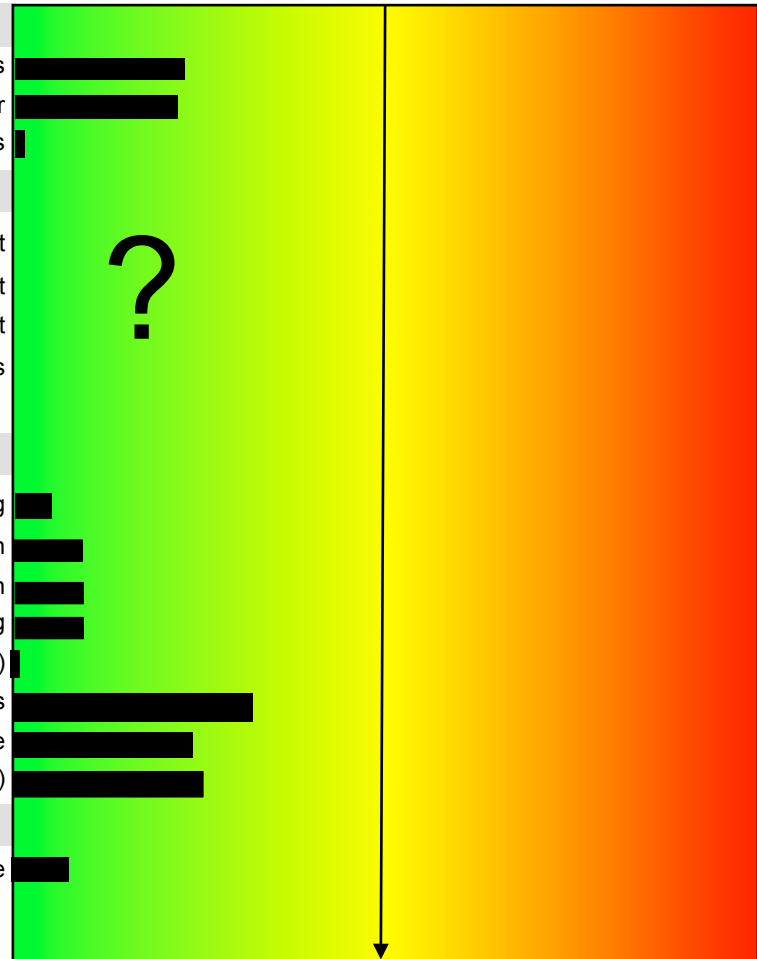
Terrestrial Habitat
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* Based on Life-Cycle Impact Assessment (SCS-002)

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Settle Performance Differences Competing Forestry Management Certifications

- Which is the Best? SFI or FSC or CSA or Others
- The SCS 002 Landscape Disruption Set of Impact Categories has been under development by DOE , BLM and other agencies for 15 years and used to assess large hydropower projects
- This set of category indicators have the necessary refinement and site specificity to determine small differences in levels of disruption in the listed habitats and key species loss.
- 30% Recycled Content paper can be more accurately described as 70% Virgin paper and therefore making these landscape performance indicators critical for EPP determination.

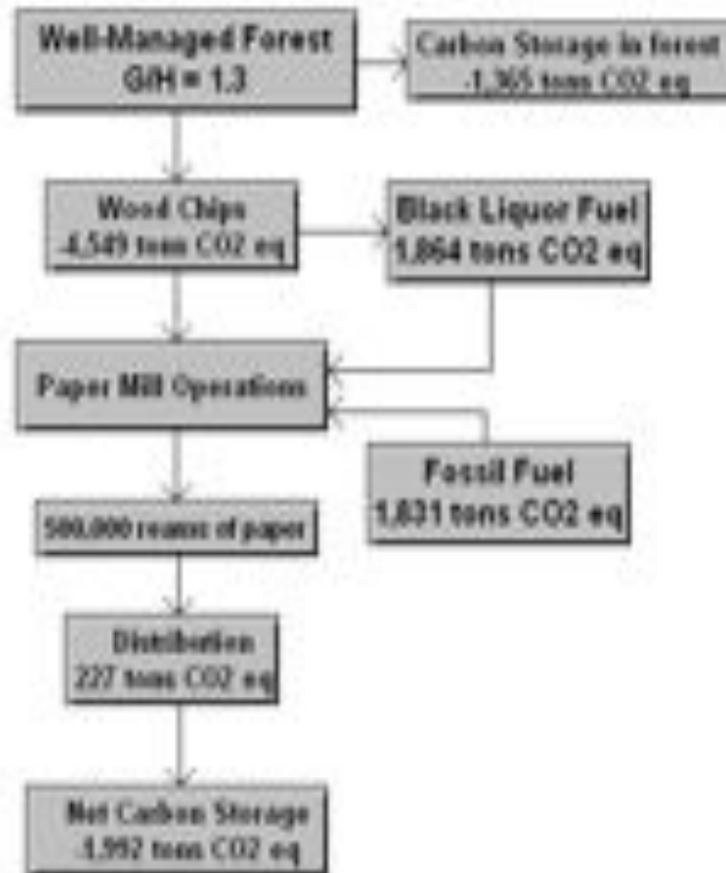
Taking a Closer Look at Greenhouse Gases in the Paper Supply Chain



Supplier 1.

Virgin Paper, FSC

Net 1,992 tons CO₂ sequestered / 500,000 reams

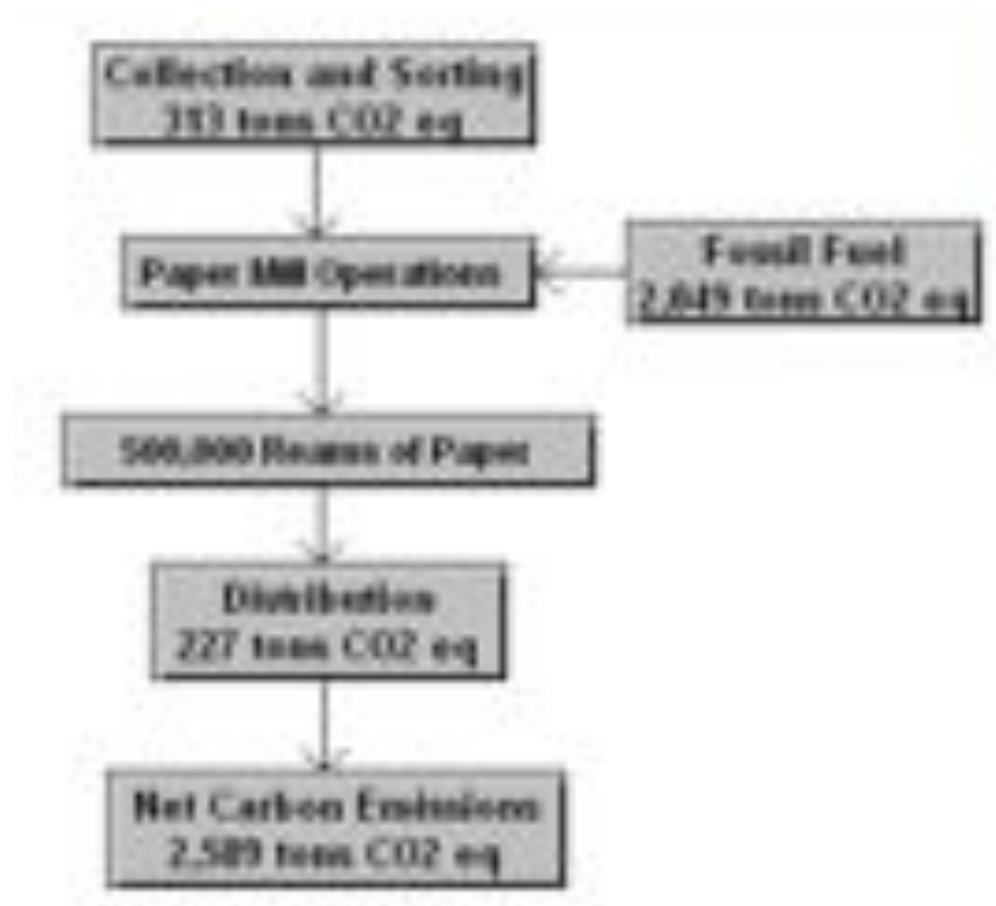


- Assumes a growth-to-harvest ratio of 1:3
- Functional unit is 500,000 reams of copier paper

Supplier 2.

100% Recycled Paper, Regional Collection/Distribution

Net 2,589 tons CO₂ emissions / 500,000 reams



- Functional unit is 500,000 reams of copier paper

100% Recycled Paper: Truck Transport Net CO₂ Loadings based on Distance

Mill	Location	Distance to Sacramento (miles)	CO ₂ Loading Tons
100% Recycled content baseline			
Ecoinvent database	n/a	621	2,862
Domestic-sourced recycled content			
West Linn Paper Company	West Linn, OR	577	2,846
Gray's Harbor Paper	Hoquiam, WA	726	2,900
Clearwater Paper Corp	Lewiston, ID	798	2,927
Moorim	Denver, CO	886	2,959
Domtar	Nekoosa, WI	1,672	3,246
Mohawk	West Chicago, IL	2,018	3,372
GPA	McCook, IL	2,045	3,382
Neenah	Neenah, WI	2,113	3,407
Wausau	Wausau, WI	2,130	3,413
Import-sourced recycled content			
New Leaf Paper (distributor)	San Francisco, CA	No Data	

Significance of Short-Lived GHG Pollutants Associated with Oceanic Shipping

Ship Transoceanic Freight (Ecoinvent)						
Fuel Consumption	2.53 kg heavy fuel oil /1000 t km					
Emissions	kg/1000 t		GWP annual	ECFp	ECFs	GHG loading
	kg/t km	km				
CO2	0.00779	7.79	1	1	1	7.8
NOx->TO	0.000136	0.136	19,560	0.5	0.05	66.5
PM10->BC	1.25E-05	0.0125	30,000	0.5	0.05	9.4
SO2(urw. Cooling)	0.00012	0.12	4,852	0.6	0.06	21.0

Short-Lived GHG Pollutants: 90% of Total GHG Loading for Shipped Pulp/Paper



Annual Time Horizon (ATH) Global and Regional GHG Pollutant List and GWP/RWPs

ATH Global GHG Loadings	Global Warming Potentials (GWP _{ATH})
Carbon Dioxide (Long Lived)	1
Other GHGs (Long Lived)	By pollutant (IPCC 20-year)
Methane (Mid-Lived)	105
Black Carbon (Short Lived)	30,000
Tropospheric Ozone (Short Lived)	19,560
Unwanted Cooling from Aerosols (Short Lived)	(RWP) 4,852
ATH Regional GHG Loadings	Regional Warming Potentials (RWP)
Arctic Region GHG Loading Group	
Methane (Mid-Lived)	105
Tropospheric Ozone (Short Lived)	19,560
Black Carbon (Short Lived)	(RWP) 41,000 - 82,000
Antarctic Region GHG Loading Group	
Tropospheric Ozone (Short Lived)	19,560

Total GHG Loading > 22,000 tons/500,000 reams

1. Disposal LCIA Declaration

100% Recycled Paper

- Disposed of from California
- Produced in China
- Sold in California Market

2. Paper LCIA Declaration

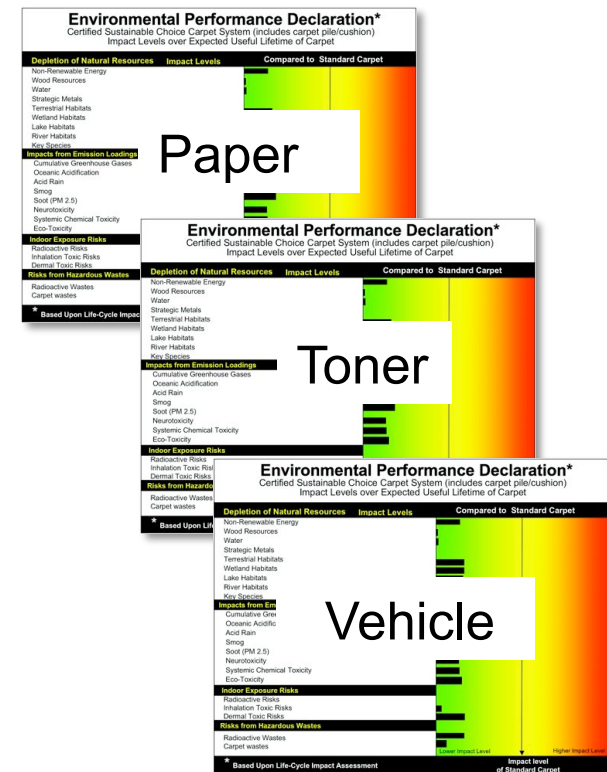
- Virgin Pulp sourced from Arctic Circle region



	Reduced Impact Product			High Impact Product		
Impact Categories	Vehicle 35 mpg Baseline	Vehicle 40 mpg	Impacts Reduced	Virgin Paper Baseline	100% Recycled Paper	Trade offs
Purchased Quantity	200 cars/ annum	200 cars/ annum		500,000 reams	500,000 reams	
Abiotic/Biotic Resource Depletion						
Non-Ren Energy (<i>Gj</i>)	5,231	4,577	654	19,090	8,910	-10,180
Wood Resources (<i>tons</i>)	NA			Neg.	Neg.	.
Landscape Disruption						
Habitats (<i>hectares</i>)				59	59	
Emissions/Wastes						
Greenhouse Gases (<i>tons</i>)	701	613	88	-3,470	1,270	-4,750
Oceanic Acid (<i>tons</i>)	234	205	29	-1,140	420	-1,156
Regional Acid (<i>tons</i>)	1	1	Neg.	2.6	3.3	-0.7
Smog Exposures (<i>persons</i>)	100	87	13	170	150	
PM 2.5 (<i>persons</i>)	140	122	18	410	530	-120
Clay Wastes (<i>tons</i>)	NC			Neg.	1,000	-1,000

Putting Paper Purchases into Context

Priority	Priority 2		Priority 1-Red Flag		
Impact Categories	Vehicle Baseline 35 mpg	Vehicle 40 mpg	Impacts Reduced	Virgin Paper Baseline	100% Recycled Paper Trade off
Purchased Quantity	200	200		500,000*	500,000*
Abiotic/Biotic Resource Depletion					
Non-Renewable Energy (Btu)	5,233	4,577	656	19,090	8,910
Wood Resources	NA	Neg.		Neg.	Neg.
Landscape Disruption					
Habitats				59	59
Emissions/Wastes					
Greenhouse Gases (tons)	703	613	89	3,470	1,270
Oceanic Acid (tons)	234	205	29	1,340	820
Regional Acid (tons)	1	1	Neg.	2.6	3.3
Smog Exposure (persons)	100	87	13	150	170
PM 2.5 (persons)	140	122	18	420	530
Clay Wastes (tons)	NC			Neg.	1,000

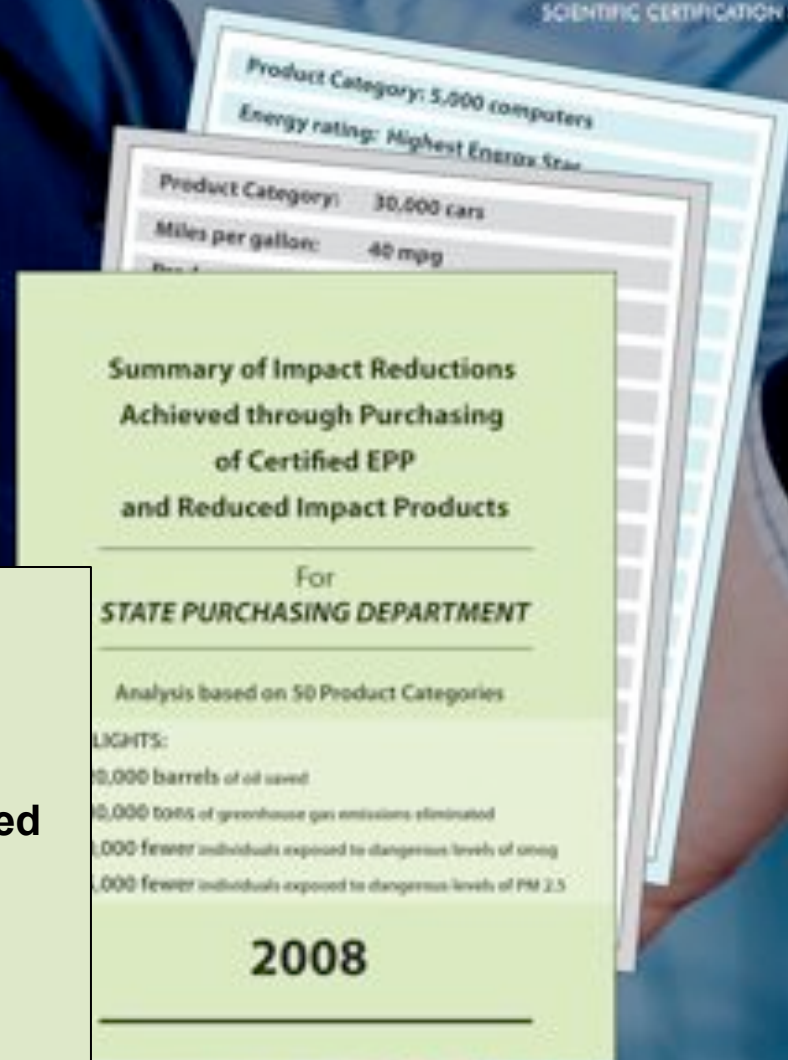


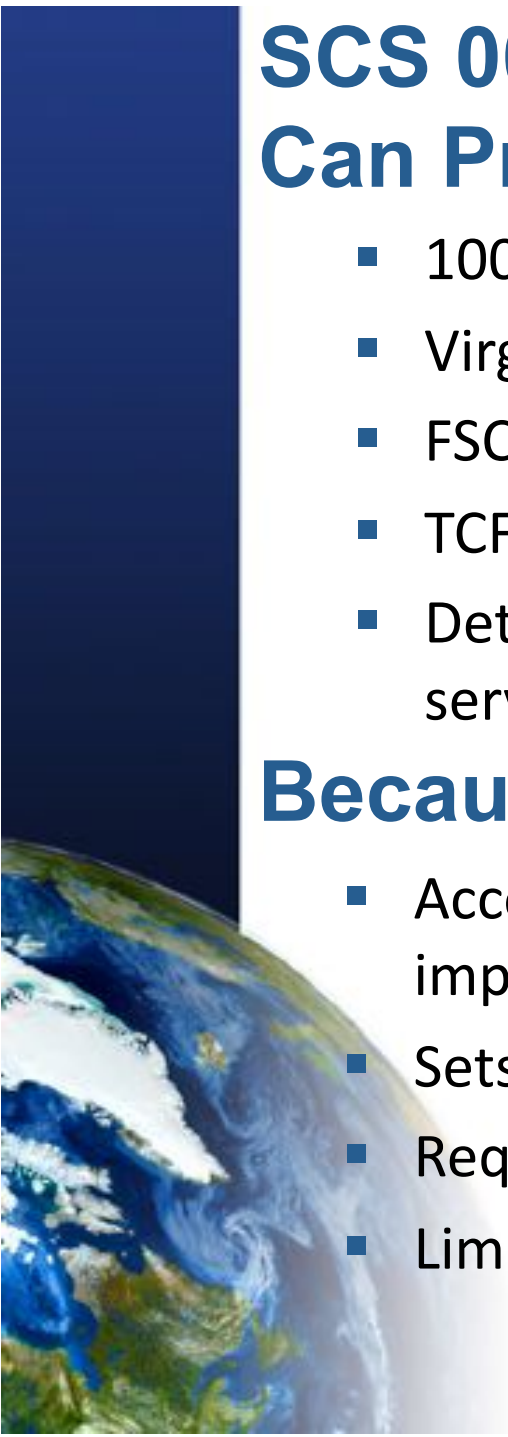
EPP Procurement Annual Impact Reduction Report



2009 LCIA Impact Reduction Highlights

- ✓620,000 barrels of Oil saved
- ✓400,000 tons of Greenhouse Gases eliminated
- ✓40,000 fewer exposures to Smog
- ✓65,000 fewer exposures to PM 2.5





SCS 002 (ANSI) LCIA Framework Can Provide Answers to:

- 100% Recycled vs 30 % Recycled
- Virgin vs Mixed vs Recycled paper
- FSC vs SFI Virgin paper
- TCF vs ECF Bleaching
- Determine if EDF Calculator accurate enough to serve as the State of California Paper Baseline?

Because the LCIA Framework

- Accounts for all human health and environmental impacts accurately
- Sets the protocols for LCIA Baselines & LCIA-Based EPP
- Requires site specific Inventory and environmental data
- Limits assumptions and requires complete transparency